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Exercise and eating habit change in the treatment of obesity

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EXERCISE AND EATING HABIT CHANGE

IN THE TREATMENT OF OBESITY

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Abstract

A pretest-posttest control group design was used to compare the effectiveness of a behavioral caloric reduction/exercise increase treatment package with a caloric reduction approach. The participants consisted of 32 people selected from those responding to a community newspaper advertisement announcing the weight control program. The caloric reduction/exercise treatment group focused on energy expenditure methods for reducing weight and improving physical fitness along with procedures for controlling food intake patterns. The caloric reduction group concentrated on procedures for controlling food intake patterns only. The results indicated that weight loss was achieved by both the caloric reduction group and the combined caloric reduction and exercise group, however, the latter group achieved significantly higher weight loss. Additionally, all measures of physical fitness improved most for the combined group. The results suggest the necessity of combining caloric reduction approaches and exercise in treating obesity.

Introduction

It has been estimated that there are between 40 and 80 million obese individuals in the U. S. alone (Stuart & Davis, 1974). The magnitude of the problem has led the U. S. Public Health Service to classify obesity as "one of the most prevalent health problems in the United States today" (U. S. Public Health Service, 1976). The most frequently cited purpose for losing weight is to improve health and decrease medical risks for clients. The medical rationale for weight loss stems from life insurance studies, for example, Hockey (1977), which have reported a strong positive correlation between increased mortality rate and being 25 to 30% or more above desirable weight. Adults who lose weight and maintain a lower body weight reduce their mortality rate to within normal limits according to sex and age (Dublin, 1953). However, weight has been emphasized as the focal dependent variable; and very little effort is made to measure the obesity client for levels of physical activities. LeBow (1977) reported that 80% of the 105 reports he reviewed taught clients to change their eating habits but failed to teach clients to increase

energy output; further, none of the studies urging increased exercise for weight control actually measured physical fitness.

The process for weight gain and loss at its simplest level involves energy input and output. This is witnessed in the existence of an unbalanced energy equation: Overweight persons consume more energy than they expend.

Such an equation allows clinicians to change weight by decreasing caloric intake or increasing caloric output. Ironically, most weight control programs are also unbalanced: They attend almost exclusively to reducing caloric intake and leave energy efforts virtually unexplored. The purpose of this review is to look at the various behavioral treatments and evaluate the effectiveness of each. The different treatment approaches can be categorized under three different headings; those treatment approaches which focus on the input aspect of weight control, those which focus on the output aspect of weight control, and those which look at weight alone. The treatment approaches which focus on the input aspect of weight control include: aversive

therapy, covert sensitization, coverant conditioning, therapist reinforcement of weight loss and self-control/stimulus control approaches. The treatment approaches which focus on the output aspect of weight control include exercise. The treatment approach which focuses on weight is bibliotherapy.

Aversive techniques

Electric shock has been used by several investigators in the treatment of obesity. Shock was paired by Wolpe (1954) in a single subject with images of desirable foods, by Meyer and Crisp (1964) in a single subject with approach to temptation foods, and by Thorpe, Schmidt, Brown and Castell (1964) in a single subject with verbalizations of a stimulus word ("overeating"). Three of these four subjects did not remain in treatment (Wolpe's died from unrelated causes), while the fourth exhibited considerable weight loss which was maintained for at least 20 months. Shock has also been utilized by the Shick Center (1976). Shick Center aversion therapy takes place in a tiny room with a two-way mirror on one wall, tempting food advertisements pasted on another,

and a "counter conditioning machine" (the "CCM") in the center of the room. Each time fattening food reaches an eater's mouth, he or she receives a rapid succession of annoying shocks from the CCM. Results show that two-thirds of the subjects involved in this method of weight control lose weight (Shick, 1976). In an experimental study, Foreyt and Kennedy (1971) compared the effectiveness of pairing the smells of desirable foods with the noxious odor of butyric acid with a control procedure. Experimental subjects averaged a 13 pound weight loss, which was significantly greater than the one pound loss of control subjects. A 48-week follow-up revealed that the experimental subjects maintained an average loss of nine pounds. The authors felt that the relationship that developed with the therapist was vital in achieving the initial weight loss.

Other than the Shick Center program which has no data regarding long term maintenance of weight loss and is quite expensive for the average person's income, no recent research on aversive therapy has been published. This may be due to a cultural distaste for administering aversive stimuli. Thus,

despite the enthusiasm in the early studies, aversive procedures by themselves, whether effective or not, are not likely to be utilized as treatments for obesity.

All studies reviewed on aversive techniques lacked any eating habit modification attempts or physical fitness measures; only one study reviewed included an exercise component in addition to aversion therapy (Foreyt & Kennedy, 1971).

Covert Sensitization Techniques

In two early articles describing covert sensitization, Cautela (1966, 1967) presents the rationale and procedures used in the application of this technique to the treatment of obesity. Typically, the patient is taught to relax, and the therapist vividly describes scenes in which the patient approaches forbidden foods and then becomes nauseous and vomits. Interspersed with these scenes are scenes in which the patient approaches the target food, feels nauseous, retreats and immediately feels a sense of relief. Fortunately, Cautela notes that there is no generalization of treatment responses to acceptable eating behavior. Somewhat more recently,

Cautela (1972) outlined a treatment program for overeating which adds covert reinforcement (i.e., for retreating when presented with target foods) to the covert sensitization program.

Negative findings were reported by Lick and Bootzin (1971) for covert sensitization. Two covert sensitization groups (differing in the explanations for treatment that were given to subjects) were compared to a no-treatment control. While all groups exhibited weight loss, the authors judged the losses to be trivial. Furthermore, no relationship (i.e., the more aversive the situation, the more weight loss) was found between the discomfort of the aversive imagery during treatment and loss. The authors note however, that some subjects changed their food preferences but did not lose weight because of their increased consumption of non-target foods.

More encouraging results were reported by Janda and Rimm (1972) and Manno and Marston (1972). Janda and Rimm compared covert sensitization to a no-treatment control and a placebo treatment. At a six week follow-up, the covert sensitization group showed a mean loss of 11.7 pounds, which was significantly

greater than that of the two other groups. Unlike the Lick and Bootzin (1971) study, a significant relationship between subjective distress, a response to the aversive situation and weight loss was found. This would suggest that the covert conditioning, rather than non-specific factors, was responsible for the weight reduction (i.e., the more aversive the covert conditioning, the greater the avoidance of target foods and hence greater weight reduction). Manno and Marson found that both covert sensitization and covert reinforcement treatments were significantly more effective than a minimal treatment group, although the two covert treatments produced similar weight losses.

Sach and Ingram (1972) found that backward conditioning (subjects visualized unpleasant scenes first, then the target food) was as effective as forward conditioning; both treatments resulted in significant decrements in consumption of target foods. Elliot and Denny (1975) found that covert sensitization was more effective than an attention placebo in producing weight loss. A third treatment comprised of covert sensitization plus false

biofeedback did not result in greater weight loss. There was a greater reduction, however, in food desirability ratings for subjects undergoing this treatment. Again, the findings suggest that factors other than aversive conditioning may be responsible for any beneficial effects of covert sensitization. It appears that covert sensitization used exclusively may result in significant weight loss or in modification of generalized patterns of inappropriate eating, however the beneficial effects may result from non-specific, placebo effects of covert conditioning rather than from the aversive conditioning component.

Again, all the studies reviewed did not utilize an exercise component for treatment, a physical fitness measure, or an eating habit modification program. This is interesting because as stated earlier, the most commonly cited reason for losing weight is to improve one's health and physical fitness and decrease medical risks.

Coverant Control Techniques

In an article presenting the techniques and rationale for coverant control, Homme (1965) describes its applicability to weight control. Essentially,

coverant conditioning is an extension of the Premack Principle to private mental events. Thus low probability thoughts (or covert operants, coverants) which are incompatible with eating are reinforced by high probability behavior. For example, thoughts such as not eating so much or so fast, which are typically uncommon thoughts for obese people, are rewarded with something the person enjoys doing, like going to the show. Studies reported by Tyler and Straughan (1970) and Horan and Johnson (1971) yielded discouraging results. Therefore, the utility of covert conditioning for the treatment of obesity remains to be demonstrated.

Further, of all the studies utilizing coverant control, not one utilized any exercise plan, physical fitness measure, or eating habit modification plan. These studies are consistent with those which used aversive therapy and covert sensitization in that they lack any way to determine the amount of weight lost on one's health or physical fitness.

Token Economy Techniques

Two case studies demonstrated the treatment of obesity within the context of a token economy

(Bernard, 1968; Upper & Newton, 1971). In both studies subjects were placed on a restricted diet and were reinforced for weight loss with tokens and social approval. Similar procedures were used by Dinoff, Rickard and Colwick (1972) with a 10 year old emotionally disturbed boy attending summer camp. All of the case reports indicated that a significant weight loss was accomplished.

Therapist Reinforcement of Weight Loss

In the first experimental study of therapist reinforcement of weight loss, Harmatz and Lapuc (1968) compared the effectiveness of behavior modification, group therapy and diet-only treatments using 21 hospitalized schizophrenic males. Behavior modification subjects were deprived of a portion of their $5.00 weekly allotment if they did not exhibit a weight loss at a weekly weighing. The subjects in the group therapy meetings discussed their weekly successes and failures as they pertained to weight loss. At the end of six weeks the group therapy and behavior modification groups had lost significantly more weight than the control group, although there was no difference between these two treatments.

However, a follow-up four weeks later revealed that the behavior modification group weighed less than the other two groups, which did not differ significantly.

Therapist controlled reinforcement presents practical problems when applied outside of an institutional setting. In typical outpatient treatment, the therapist may be able to control reinforcing contingencies for one hour per week. Tighe and Elliot (1968) described a technique involving threatened loss of money as a method of establishing therapist controlled reinforcers in the natural environment. Although the authors applied the technique to modifying smoking behavior, they suggested that it could be applied to overeating and other undesirable behavior.

In an ABAB designed experiment, Mann (1972) evaluated a program in which personal possessions (i.e., clothes and money) were surrendered to the experimenter to be used as reinforcers. A contract was signed which specified the subject's terminal weight reduction goal as well as the number of pounds to be lost during each two weeks during the study.

All eight subjects in the study maintained or increased their weight during the baseline, lost weight during the first treatment period, regained weight during the reversal period, and finally lost weight during the second treatment period. A second experiment was conducted which revealed that the punishing contingencies (i.e., permanently losing personal possessions) were an essential component of the treatment. Although treatment was successful (five subjects reached their goal; the remaining subjects achieved reductions ranging from 40 to 70% of their goal) there were several problems. Since the target was weight, rather than actual eating behavior, several participants made use of extreme measures such as taking laxatives or diuretics to promote rapid weight loss. Also, no follow-up data were reported, and hence the long term effects of the treatment are unknown. However, an indication of the long term effects of this type of treatment was provided by Jeffery, Christensen and Pappas (1977). Although the four subjects in this study exhibited a mean weight loss of 27 pounds by the end of treatment, at the six month follow-up one subject returned to his baseline

weight, while a second regained 14 of the 32 pounds he had lost.

Christensen and Barrious (1975) randomly paired overweight participants each week during their treatment program. At a weekly weigh-in a partial return of their monetary deposit was contingent upon the weight loss of both partners. The anticipated supportive relationship between partners did not develop. The results after five weeks of treatment were not significantly better than those of the control group. During the follow-up period in which there were no contingencies in effect there was a reported weight gain for both groups.

Possible suggestions would be to utilize measures of the individual's physical fitness, and utilize an exercise program to evaluate not only the individual's weight loss but improved fitness as well.

Self-control Techniques

Since the publication of Stuart's landmark case series (Stuart, 1967), the behavioral treatment of obesity has been extensively reported and reviewed. In an earlier review of several case reports and experimental studies it was concluded that "several

behavioral procedures are effective in treating obesity, at least on a short term basis" (Abramson, 1977). Levitz and Stunkard (1974) compared self-control programs conducted by mental health professionals with self-control programs conducted by TOPS (a self-help group) leaders, with nutrition education conducted by TOPS leaders and with the continuation of the usual TOPS program. The self-control program consisted of (a) introducing changes in the act of eating, including slowing down the pace and leaving food at the end of the meal, (b) developing control over the stimuli signaling eating, including learning to eat at specific times and in a very limited number of places, and removing excess food from the environment, (c) planning food intake well in advance of eating, (d) responding to boredom, fatigue, and emotional states with activities that do not involve eating, and (e) instituting group and individual rewards for behavior change and weight loss. The nutrition education program consisted of simply teaching general principles of nutrition. The usual TOPS program included a weigh-in, an announcement of weight gains and losses, rewards and

sometimes punishments, and a general discussion of weight related topics. Both behavioral self-control groups had a lower attrition rate and lost more weight during the three month treatment period than the standard TOPS group or nutrition education group.

Complex Self-control Techniques

Most of the research on complex self-control programs has yielded positive outcomes; thus recent work has been directed to determining which of the various components of these programs are critical, and which, if any, are superfluous. The components that have been studied include: Self-monitoring, self-reward and punishment, exercise, coverant conditioning, and stimulus control techniques.

Self-monitoring has been a component of virtually all self-control programs. Romanczyk (1974) contrasted weight loss of a no-treatment control with treatments comprised of: daily recording of weight, self-recording of weight and caloric intake, behavior management instructions without self-recording of both weight and caloric consumption, or behavior management instructions with self-recording of both weight and caloric consumption. While there was no difference

between the no-treatment control and daily weight recording groups, the major finding of the study was that self-recording of both weight and caloric intake (without therapist supervision) was as effective as the behavior management and behavior management with self-recording treatments. Both of these treatments included weekly therapist contact. These findings are difficult to interpret, however, because of the brief duration of treatment (four weeks). It is possible that a longer period of treatment would have allowed differences between treatments to emerge. Nonetheless, the findings suggest that self-monitoring of daily caloric intake is a significant component of complex self-control programs.

Self-reward and self-punishment as components of a self-control program were the subject of two studies conducted by Mahoney and his associates. Mahoney, Muora and Wade (1973) used five groups to compare the effects of self-reward, self-punishment, a combination of both, self-monitoring, and a control. All groups (including the control) received booklets describing stimulus control techniques. Self-reward and self-punishment subjects were instructed to award or fine

themselves a part of their monetary deposits contingent upon weight loss or other desirable behaviors. A four month follow-up indicated that the two treatments which included self-reward were superior to self-punishment or control treatments. In a follow-up study, Mahoney (1974) compared self-monitoring with self-reward for weight loss, and self-reward for changes in eating habits. The results at the end of treatment and at the two month follow-up indicated that self-reward was superior to self-monitoring, and that self-rewards for habit change were more effective than self-reward for weight loss.

The superiority of self-reward to self-monitoring was also demonstrated by Bellack (1976). In this study the subjects were specifically instructed to do their self-monitoring before eating. Despite the strengthening of the self-monitoring procedure, self-reinforcement led to greater weight loss.

In perhaps the most comprehensive study on complex self-control techniques, Romanczyk, Tracey, Wilson, and Thorpe (1973) compared the relative effectiveness of self-monitoring, covert sensitization, relaxation training, stimulus control

and therapist reinforcement. The major finding was that self-monitoring was as effective as any of the other techniques, individually or in combination. However, the brief duration of treatment (four weeks) may not have allowed for differences in treatment effectiveness to have developed. A second experiment, which included a follow-up, compared self-monitoring to a complex self-control treatment package which included all of the techniques used in the first experiment. Although both treatments produced significant weight losses, the complex self-control treatment was significantly more effective. This difference was maintained at 3 and 12 week follow-ups.

McReynolds, Lutz, Paulson and Kohrs (1976) compared a typical complex self-control package with a simpler program that was based exclusively on stimulus control techniques. These techniques, derived from Schachter's (1971) external cue hypothesis, were intended to reduce the number of environmental cues that promote eating. Self-control within this stimulus control focus was achieved in two ways. First, a "personal plate" and "personal bowl", the use of which was intended to increase subjects'

awareness of eating habits (especially the frequency and amount of eating), were given to all subjects. A 6-ounce clear bowl and 9-inch dinner plate with a wide rim were used throughout the 15 weeks of treatment within the following three rules: (a) everything that is eaten must be taken off the personal dishes; (b) the total amount of food to be eaten at any one time must be put on the plate and/or bowl before eating actually begins; (c) no second helping may be served to the personal plate or bowl; once the initial serving of food is eaten, eating is to stop. Subjects were encouraged to use their personal dishes even when eating out, although in no case was noncompliance punished.

In addition to the daily use of the personal dishes, subjects received nine separate lessons on the "environmental control" of eating at each of the various stages of the eating process. Thus, eating was discussed as it entails buying, storing, cooking, serving, and ingesting of food and the cleaning of the serving table and kitchen. Both groups exhibited equal weight losses at the end of treatment, but the stimulus control treatment was superior at the three

and six month follow-ups. The implication is that many of the techniques included in complex self-control programs may be unnecessary.

Bibliotherapy Techniques

A number of self-help books on weight control (Jeffery & Katz, 1977; Stuart, 1978) have appeared recently, but Hagen (1974) did the first study concerning bibliotherapy and weight control. His bibliotherapy group subjects received a revised version of the treatment manual used by Wollersheim (1970) in 10 weekly installments. Manuals were distributed and homework collected through the mail; there was no therapist contact. A second group used the manual and had a one hour weekly meeting with the therapist. The third and fourth groups were a therapist led behavioral group and a no-treatment control group. The three experimental treatments resulted in significantly greater weight losses than the control. There were no differences between the three treatments, suggesting that bibliotherapy based on behavioral principles is an effective treatment.

Hanson (1974) and Bellack, Rosensky and Schawartz (1974) reported similar results. Making

use of a programmed weight reducing manual, Hanson compared high and low contact bibliotherapy groups with a no-treatment control, attention placebo, and leader led self-control groups. Post-treatment measures of weight loss and percentage of overweight lost indicated that the three behavioral groups did not differ significantly but were significantly more effective than either the control or placebo treatments.

Several studies have attempted to investigate the role of the therapist in self-control programs. Typically the effects of a self-control group led by a therapist have been compared with a treatment in which the self-control procedures were presented in writing, with little or no therapist contact. The success of the leaderless treatments (bibliotherapy) warrants their consideration as a separate treatment approach.

Although all the studies reviewed include some aspect of eating habit control, again as in earlier treatment approaches, no one included an exercise plan, or physical fitness measure.

Exercise Techniques

Relatively few clinical weight loss studies have evaluated the effect of exercise. One early exercise program found that combining nutrition education and exercise is more effective than no treatment for weight loss (Christakis, 1966). In a subsequent study Gwinup (1975) showed that exercise alone is an effective treatment procedure for chronically overweight women. His 11 subjects lost an average of 22 pounds each in their first year of treatment. More rapid weight loss was found in a combination group by Zuti and Goldberg (cited in Fixx, 1977) in a study that compared exercise alone with caloric intake reduction alone and with a combination of the two techniques. After 16 weeks, the groups averaged 11.7, 10.6, and 12 pounds lost, respectively, showing no difference in weight loss across groups. Unfortunately no effort was made to measure physiological changes in these subjects (e.g., blood pressure or pulse rate).

Katahn (1982) discovered (through his research at several weight control centers in the U. S.) that fat

persons on the average were not eating more than the standards set by nutritionists for persons of average weight, but that they were walking about three miles per day less than thinner people in similar occupations. He also found that when the focus of a weight control effort was on eating habits only (i.e., controlling cues in the environment which elicit eating), lost weight was regained. Therefore, he concluded that an active life style was essential for permanent maintenance of a desirable weight. As a result, Katahn (1982) designed and implemented the Vanderbilt Weight Program, which consists of eating habit awareness (keeping an eating diary), an extra activity component and a low fat diet. The extra activity component involves walking an extra 45 minutes each day, which burns off approximately 200 extra calories per day. Over 1500 persons have participated in the 8-week program. Results show that after following the low fat diet/extra activity program, 70% of the individuals have lost between one and three pounds a week, 48% of the participants have continued to lose weight, and 52% of the participants have averaged another nine pound loss during the follow-up year.

Additionally, studies that utilize exercise along with other treatments found that exercise in combination with diet or a behavioral management procedure produced greater weight loss than did single exercise, dietary, or behavioral interventions (Dahlkoetter, Callahan & Linton, 1979; Duddleston & Bennion, 1970; Harris & Hallbauer, 1973; Stalonas, Johnson & Christ, 1978).

The positive results with the combined procedures were further accentuated in the three studies that included follow-up data. Dahlkoetter et al. (1979) found that a combination group (eating habits plus exercise) continued to lose weight at a 6-month follow-up, whereas no further losses were noted for the single intervention exercise or eating habits group. Similarly, Harris and Hallbauer (1973) found no differences between an exercise self-control/ contracting group and a self-control/contracting group at post-treatment, but they found a significant effect favoring the exercise subjects at a 7-month follow-up. In addition, Stalonas et al. (1978) found that an exercise/behavioral tasks group and an exercise/ behavioral tasks self-reinforcement group continued

to lose weight at 3 and at 12-month follow-ups. The behavioral tasks/self-reinforcement subjects continued to lose weight at three months, but they had regained to almost posttreatment levels at one year. The behavioral tasks group had regained half of the original posttreatment weight loses by the one year follow-up.

A number of mechanisms that may mediate the effects of exercise on weight loss have been suggested: Increased activity may decrease appetite (Bjorntorp, 1976; Mayer, Roy, & Mitra, 1956); regular exercise counteracts the homeostasis reduction in metabolic rate, which reduces the effectiveness of caloric-intake restriction (Brownell & Stunkard, 1980; Thompson, Jarvie, & Lahey, 1982); exercise serves as a healthful substitute for or timeout from snacking as a coping technique (Epstein & Wing, 1980); and exercise may reduce stress from dieting or other sources (Foreyt, Goodrick, & Gotto, 1981). Although most obese patients seek to reduce primarily for cosmetic reasons, weight lossses that are cosmetically disappointing may, when combined with an exercise program, be associated with significant improvements

in cardiovascular risk indicators such as hypertension and improvements in body tone (Stamler, 1980).

As noted by Epstein and Wing (1980), exercise may provide important benefits in the control of energy balance, but it can only benefit individuals who adhere to the program. Although Epstein and Wing found little information on adherence to exercise by obese subjects in the behavioral literature, investigators in the areas of cardiac rehabilitation and exercise physiology have reported that obese subjects may be more likely than normals to drop out of exercise programs (Dishman & Gettman, 1980; Massie & Shephard, 1971).

Attrition is a serious problem in most exercise programs. Approximately 50% of participants drop out of exercise programs, even when the participants have compelling medical reasons to adhere (Brownell, Stunkard, & Albaum, 1980; Carmody, Senner, Malinow, & Matarazzo, 1980; Sanne, 1973; Taylor, Buskirk, & Remington, 1973). Unfortunately, the more strenuous the activity, the less willing and able obese patients will be to participate.

Studies have addressed directly the issue of

adherence to exercise regimens. Reinforcement, contracting, and social factors have been found useful in increasing participation (Epstein, Thompson, & Wing, 1980; Heinzelmann & Bagley, 1970; Wysocki, Hall, Iwata, & Riordan, 1979).

Another important consideration relates to the manner in which the exercise is performed. A distinction has recently been made between routine and programmed activites (Brownell & Stunkard, 1980). Routine activities include interventions that increase caloric expenditure by making alterations in lifestyle such as using stairs and parking further from destinations and walking. Programmed activities are exercise sessions in which an individual plans on engaging in a certain activity for a certain time period or until some criterion is met. An attempt is made to set aside a block of time each day for a specific activity. Exercise studies have involved routine activities (Dahlkoetter et al., 1979; Harris & Hallbauer, 1973; Stalonas et al., 1978) as well as programmed activities (Duddleston & Bennion, 1970; Gwinup, 1975; Kenrick, Ball, & Canary, 1972; Leon, Conrad, Hunninghake, & Serfass, 1979; Moody, Kollias,

& Buskirk, 1969).

There are advantages and disadvantages to both procedures. As pointed out by Brownell and Stunkard (1980), routine activities "are not painful or time consuming, and do not require equipment or special facilities" (p. 313). Programmed activities, however, present various advantages related to energy expenditure that routine exercises lack. For instance, programming exercise allows one to engage in long-duration, moderate-intensity aerobic activities. Consequently, a sustained period of elevated metabolic rate results, promoting high levels of energy expenditure and possible postactivity elevations in metabolic rate.

A combination of routine and programmed exercise would seem optimal. Researchers might provide subjects with suggestions for increasing routine activities while concurrently involving them in structured programmed activities. Programmed formal exercise might then be phased out with procedures designed to teach the subject to maintain programmed exercise at home.

Summary and Directions for Further Research

Obesity is a complex phenomenon, and its treatment is perhaps even more intricate. Unfortunately, management of the problem has not been guided by a knowledge of its physiology. Researchers have extensively used caloric restriction as an intervention even though the body's adaptive lowering of expenditure during food deprivation is an established fact of energy balance (Benedict, Miles, Roth, & Smith, 1919; Garrow, 1978). Research is just beginning to unravel specific energy balance systems involved in the development and maintenance of obesity. The successful prevention and treatment of obesity are dependent on an understanding of these mechanisms and the incorporation of this knowledge into intervention strategies. Tentative evidence suggests that exercise in conjunction with other treatments produces greater weight loss than do single intervention procedures (i.e., caloric intake restriction interventions); and a combination of routine and programmed activities may be optimal for weight control.

However, it appears that most of the studies

which have been conducted focus on the input aspect of weight control (i.e., eating habit change). Thus, we know quite a bit about input effects of weight control, however, we do not know much about energy expenditures. Research to date does strongly support the inclusion of an exercise component in a weight loss program.

There are several reasons why poeple lose weight, but as stated earlier, the most commonly cited reason is to improve one's health and reduce health risk factors. There are a variety of techniques that can be effective for short term weight control, but including a physical fitness measure to determine the effects of weight loss on health has not been carried out. It would also seem to be important to include physical fitness measures to determine the effects of exercise on one's health.

Therefore, it was felt that the question of input only versus concentration on input and output aspects of weight control deserved a more careful investigation, utilizing more adequate measures. Only one measure of physical fitness has been reported for weight loss treatment programs, leaving unclear the exact effects

of weight loss on the physical capacity of the individual (Stalonas et al., 1978).

Therefore, the need for a more comprehensive investigation into the output effects on weight control and the interrelationships between output, weight and health status prompted the present experiment. The experiment compared the effects of (a) a behavioral caloric reduction/exercise increase treatment package with (b) a caloric reduction approach. To measure the effects of these treatment packages as comprehensively as possible, measures were taken on (a) weight loss, (b) physical fitness, and (c) eating habits.

Method

Subjects

Thirty-two people (18 females and 14 males) were selected from those responding to a community newspaper advertisement announcing the weight control program (see Appendix A). In order to be selected for the study the respondents were required to (a) be at least 15 and no more than 75 pounds overweight according to Farquhar's (1978) weight formulas, (b) be between the ages of 16 and 50, (c) sign a consent form provided by the experimenter (see Appendix B), (d) have a medical examination by their physician prior to treatment, (e) not be currently involved in any other weight control or exercise program, and (f) render to the experimenter a $45.00 deposit which was refunded contingent upon their attending every session. The selected clients ranged in age from 18-49, with an overall mean age of 32.5; their weight ranged from 138-275 pounds, with a mean weight of 165.8 pounds. There were 28 Caucasian participants and 4 Mexican-American participants. Twenty-four participants had received a college education while the remaining 4

participants had a high school education.

Instruments

Equipment which was used for testing and class sessions included one 16-inch (40.6 cm) high wooden bench, three Sears and Roebuck stopwatches, and one Health-o-meter doctors' clinical beam scale (model #230). The study took place in a 12 m x 14 m classroom building adjacent to the University of the Pacific's Psychology department.

Procedure

The program consisted of an initial assessment meeting and a nine week treatment phase with a one month telephone conference follow-up. People who responded to a newspaper advertisement announcing the weight control program were contacted by phone and were asked to attend an introductory meeting during which all of the procedures of the program were explained. They were asked their present weight, age, and to indicate if they were currently in any weight management or exercise program. If they were currently in another program, they were not eligible for this study and were informed of the situation and criteria. If they were not currently in any other

program, it was explained to the respondents that further assessment to determine whether they were eligible for the program was to be conducted at the introductory meeting.

Those respondents who were eligible for treatment were evaluated at the introductory session according to the criteria set forth in the procedural subjects section. The resulting participant group was then randomly assigned to one of the two groups: (a) exercise/eating habit treatment group, or (b) stimulus control of eating habits control group. Participants were contacted the next day by phone and at that time were informed as to the exact starting date of the weight control program. The experimental group of participants started the day after the pretesting session and the stimulus control of eating habits control group started three days later during the same week. Participants were asked for the $45.00 deposit during the first session and told that the deposit would be returned to them contingent upon their attending every session. Deposits were refunded in the following manner. One dollar was refunded for attending the first week's session, two dollars for

attending the second week's session, and so on, up to nine dollars refunded for attendance during the ninth week. If they did not attend every session, the money was sent to an organization which they had previously stated that they disliked. This occurred just prior to beginning the first lesson. Only one two-dollar deposit was mailed to an organization which a participant disliked, for his not attending week two's class.

Measures

All participants were evaluated at the pretreatment and post-treatment periods, using three basic categories of evaluation: weight loss, physical fitness, and personal eating habits. Assessment of weight included body weight in which participants were weighed on the scale provided. Assessment of physical fitness included two measures of activity performance (a 3-minute step test and a sit-up test), and one index of cardiovascular functioning (resting/recovery pulse rate). The 3-minute step test (Katahn, 1982) required subjects to step up and down from a 16-inch high bench for three minutes at a rate of 24 steps per minute. It was explained that the correct procedure

has four counts: beat, step up with right foot; beat, step up with left foot; beat, step down with right foot; beat, step down with left foot. Subjects were told to repeat this procedure and to remember to straighten their legs as they went up and down. After exactly three minutes or as long as participants could step, they were all asked to sit down on a chair and relax without talking. The subject's recovery pulse rate was then taken within five seconds after the step test, and the tester counted the pulse rate for a full minute and recorded it. Step test time was measured by the number of seconds the participant spent stepping at the prescribed rate up to the full three minutes.

The sit-up test measured the number of sit-ups completed in one minute. This took place ten minutes after completion of the step test. The sit-up test consisted of having the participants lie on their backs with their legs straight and hands clasped behind their necks. They were asked to sit up so that the trunk of their body was at a right angle to their legs. Their heads touched the floor each time they returned to the starting position and their heels did

not leave the floor.

Personal eating habits and present activity levels were measured by interviews conducted with each participant by the experimenter. The interviews were conducted to determine present eating patterns, sense of control over one's eating behavior, and amount of activity engaged in (see Appendix C). Interviews were utilized due to a lack of availability of validated eating habit and activity level questionnaires.

An assessment of percentage body fat utilizing skinfold calipers was initially proposed as a component of the testing procedures, however due to the absence of an observer the measure was not collected.

Pretesting

Pretesting took place at the introductory meeting. All of the participants were weighed in and then were interviewed regarding their eating habits and activity levels. Resting pulse rate was then taken by having the experimenter first place his hand on the participant's wrist over the main artery, and record and time with a watch the number of beats per minute period. Each participant then completed the

3-minute step test and the sit-up test 10 minutes later to the best of their abilities.

Observer Training

Two graduate students (one male, one female) and four undergraduate students (two male, two female) served as observers. One observer was placed at each of five stations where they administered a particular test for all participants. Observers were trained for one session (lasting one hour) prior to the introductory meeting; each procedure was first demonstrated by the experimenter and then practiced by each observer with supervision and feedback on their performance from the experimenter. The observers involved in the 3-minute step test and the sit-up tests (the number of sit-ups completed in one minute) were considered competent to test participants once they achieved 100% agreement for two consecutive times with the experimenter on practice observations of volunteers doing the 3-minute step test and sit-up test. The observer involved in the interviewing of eating habits and activity levels was considered competent to interview participants once he had read the questionnaire form. The observer in this case was

the experimenter who designed the questionnaire. The observer involved in the recording of pulse rate was considered competent to test participants once she had been observed practicing and achieved 100% agreement with the experimenter for two consecutive observations. The observer involved in the weighing of participants was considered competent to test or weigh participants once he had achieved 100% agreement with the experimenter on three practice weigh-in recordings.

Observers took two recordings for each participant on all measures except the 3-minute step test, the sit-up test (number of sit-ups completed in one minute) and the interview. The observer then calculated the mean of the two observations, for pulse rate, as the final reported value. These same testing procedures were also used for the post-tests for both groups.

Design

The design used in the present study was the Pretest-Post-test Control Group design in which participants were randomly assigned by the use of a random numbers table to either the experimental group receiving the combination of stimulus control of

eating habits and exercise treatment package, or the control group receiving only stimulus control of eating habit instruction. Both groups were tested at the pre-treatment and post-treatment (nine weeks later).

In addition there was a follow-up assessment after treatment was completed. After the follow-up was completed, participants in the caloric reduction group were given the opportunity to acquire the exercise information (i.e., copies of the stretching and flexibility exercises and the graduated walking program) from the experimenter. Follow-up was conducted in the form of telephone conversations with the experimenter. Participant's weight was requested, as well as their resting pulse rate and any problems or successes they had experienced in the past month as they related to their weight control efforts. The experimenter phoned the participants, greeted them and explained that the reason for calling was to obtain follow-up information on the measures that had been taken one month prior. Additionally, any questions that participants had were answered. Follow-up measures were not able to be obtained in the lab setting (as during pre- and post-test sessions) due to

lack of availability of observers and participants during the summer months.

Treatment

Participants in the experimental and control groups attended eight one and one-half hour group meetings led by the experimenter. The first session was devoted to an introduction of the behavioral approach to weight reduction and to a presentation of the general class format. The experimenter began the introduction as follows:

> "If you are like most people, you probably have tried many different ways to control your weight including going on various fad diets, joining health spas, buying elaborate exercise equipment, becoming a member of an organized weight control group, taking over-the-counter or prescription medications, and possibly trying hypnosis. Although you may have lost a great deal of weight by means of these various methods, you probably have had little or no success in keeping off the weight you have lost for any

appreciable length of time. Most people which I have seen practice a "lightswitch" pattern of weight control. When their switch is "on" they worry about their weight, go on various diets, and lose weight with varying degrees of success. When their switch goes "off," they return to their old habits, and ultimately they regain any weight they have lost. This up and down pattern of weight change is not particularly good for physical or mental health.

"Another point I would like to make is that the more frequently a person goes on a diet, the more rapid the onset of what is known as metabolic slow down. This simply means that when a person goes on diet after diet the body comes to anticipate this and slows down to conserve energy and hence fewer calories are needed to maintain one's weight. Accompanying this slow down are feelings of laziness, dragging, and fatigue.

The point is that this is common in people who diet and have little or no physical activity prior to dieting. So I feel it is important to point out that you may experience, when beginning this program, fatigue, and it is primarily due to this metabolic slow down and not just the increase in physical activity.

"In this program I am suggesting that you try a new approach for managing your weight. This approach will require that you change the way you typically view your difficulties in controlling your weight. In the upcoming lessons of this program I will be giving you a lot of information about weight management. Each lesson will be tied into homework assignments. In these assignments you will recieve many suggestions for how you can design a program suitable for your particular weight management problems. There are

quite a few myths surrounding weight control, and there are also many unproven and controversial ideas. New fad diets that emphasize quick and easy weight loss are coming out all the time and there is almost always a doctor or "professional" somewhere who will support each one of them. In this program I hope to give you some guides that you can use to separate the fact from the fiction in what you may read about weight control. Many of you will be surprised to discover how much you already know that can help you achieve long term success in managing your weight.

"I should say right now that this program is not the only one on the market that can help people achieve permanent success by managing their weight. Several other professionals have published manuals that I also could recommend to support and add

to what I say, for example, Weight Watchers (Stuart, 1978) and the Vanderbilt Weight Control program (Katahn, 1982).

"I do feel that this program is a safe, relatively painless, and effective way by which you can achieve permanent weight control. However, you must realize that weight management is not easy if permanent results are your goal. Such results can be obtained only through changes in your total lifestyle, and these changes take time and effort on your part. I will have much more to say about lifestyles throughout this program. The old saying that you can't get something for nothing applies especially well to weight control.

"So prepare yourself for a struggle -- sometimes frustrating and disappointing, but often stimulating and rewarding. While I don't expect

it to be easy for you to control your weight, I hope to be able to help you make your experience with this program as pleasant as possible. I do not expect you to lose weight quickly (unless you have very little to lose), but I do hope to help you establish a way of life that will make your losses in this program permanent losses.

"Let's talk for a few minutes about the program you are about to begin. I am emphasizing a behavioral approach to weight management. This means that I will focus on more than your diet (that is, what and how much you are eating each day) although this will be one of several important parts of the program. I will be asking you to focus on your eating behavior (i.e., where you eat, how often, at what times, etc....) and on your daily activity level (how

often do you exercise, get any physical activity, etc....). I will show you how to determine what aspects of your present lifestyle may be contributing to your current weight. Then I will instruct you in ways to solve each problem you encounter. For example, with respect to eating I will show you how to change your environment so that you will find yourself less likely to overeat. You will practice ways to change how you eat that will help you develop a greater sense of self-control. I will show you how to make (healthful) eating more rewarding than overeating. As you begin to lose weight, I will show you how to develop a more active lifestyle that not only will help you lose weight but will add energy to your reserves for both work and play and increase your feelings of

general well-being. [This aspect of activity was only mentioned to the combination group of participants.] You will be helped to accomplish this by taking a series of small steps, one at a time, that will greatly reduce the difficulties and frustrations you have had in your previous attempts to lose weight and maintain that loss.

"I have divided the program into a series of lessons that I will present and discuss with you during weekly group sessions. In order to help you if you have any questions, problems or comments regarding the homework assignments which will accompany some of the lessons, I will phone each of you periodically between lessons. I do have one final recommendation. You should make a point of going through the entire program as you work on your weight. In this way you will get the maximum benefit of the knowledge of how to manage your

weight effectively."

Weight Measure

Participants were then weighed-in privately in a partitioned corner of the room, one at at time; they were asked to step on the scale and hold still while the experimenter recorded their weight.

In calculating a participant's number of pounds overweight, the experimenter first calculated the participant's ideal weight by using Farquhar's (1978) ideal weight formula. For women, ideal weight = height in inches x 3.5 - 108; for men, ideal weight = height in inches x 4 - 128. Participant's height was measured using the doctor's weight scale just prior to weighing the participant. After calculating a participant's ideal weight, this figure was subtracted from the actual weight recorded on the scale, in order to yield number of pounds overweight for each participant.

Lesson One

Lesson One encompassed having the participants increase their daily amount of walking on a gradual basis and the keeping of a personal eating diary (see Appendices D, E, F, G, and H). The general

procedure or format for subsequent class meetings was as follows: (a) take attendance, (b) check homework, (c) have lecture and discussion, and (d) give homework asssignment to participants.

Eating habit/exercise treatment group. This treatment group focused on energy expenditure methods for reducing weight and improving physical fitness along with procedures for controlling food intake patterns. Materials for the class were compiled from programs by Farquhar (1978), Yoshida (1980), Katahn (1982), Solomon (1980), and Cooper (1970). Exercise was expected to create a negative energy balance in which more energy was expended than taken in. The group concentrated on procedures for controlling food intake patterns as well. Eating habits were focused in on as a means of reversing the energy equation to a negative balance by decreasing the amount of food intake below energy requirements for output levels. In every lesson presented, participants were asked to practice the behavioral changes requested of them. This was accomplished by the instructor first demonstrating the task, then the participants modeling the

instructor while given positive and corrective feedback.

In the first lesson, participants were taught to monitor their present activity patterns, begin back strengthening (to begin to strengthen back muscles for more demanding physical activity later on; the graduated walking program) and flexibility exercises, increase their amount of walking, keep a daily activity record, weight record, and eating diary. Through the following weeks, the participants were introduced to other aspects of eating habit control, fitness and exercise.

Lesson Two (see Appendix I) took place during week two and consisted of teaching participants how to evaluate their week one eating diaries along with keeping another eating diary for week two with some important additions; and how to set a reasonable weight reduction and caloric intake goal. The important additions to the eating diary included the following: (a) making participants more aware of other aspects of their environment that might be influencing their present eating behavior, (b) introduction of a behavioral strategy that would

interrupt their current pattern as they began to eat, and (c) giving participants practice in making conscious decisions about their eating. Lesson Two was then discussed and the homework assignment distributed (see Appendix I).

The third week consisted of Lesson Plan Three (see Appendix J) which helped participants to understand fitness in relation to body fat and to heart and lung functioning. Lesson Three was then discussed and the homework assignment distributed and explained (see Appendices K, L, and M).

Lesson Four (see Appendix N), which was taught during week four, involved the explanation of behavioral chains of events and how they relate to one's eating behavior, how recognizing the "links" of the chains can help one to change his/her lifestyle, particularly as it relates to eating, and how to deal with the influence of one's social environment on one's eating behavior and activity level. Lesson Four was then discussed and the homework assignment (see Appendix O) distributed and explained.

Lesson Five (see Appendix P), week five,

consisted of an introduction to the physiology of weight management and an explanation of the unbalanced energy equation as it relates to weight control. Lesson Five was then discussed and the homework assigned and explained.

Lesson Six (see Appendix Q) consisted of further development of participants' walking programs and instructions of how to use their heart rates as guides in their walking programs. Lesson Six was then discussed and the homework (see Appendix R) distributed and explained.

Lesson Seven (see Appendix S), week seven, consisted of completion of a task list to evaluate the participant's general fitness, activity and weight reduction and how they interrelate, and continued further development of their walking programs. Lesson Seven was then discussed and the homework handed out and discussed.

Week Eight involved Lesson Eight (see Appendix T) and consisted of further building one's flexibility and strength, principles and guidelines for flexibility and muscular endurance exercises, and a second program for developing strength and

flexibility was introduced (see Appendix U).

Week Nine consisted of posttesting using the same measures used at pretesting. Participants were thanked for participating in the program and informed that if they had any questions or comments regarding the program they should contact the experimenter.

Stimulus Control of Eating Habit Control Group. This group concentrated on procedures for controlling food intake patterns. Eating habits were focused on as a means of reversing the energy equation to a negative balance by decreasing the amount of food intake below energy requirements for output levels. Topics for this class paralleled those of the eating habit and exercise change group, with the omission of the exercise information. Additional examples and practice of how to control food intake patterns replaced the omission of the exercise topics (see Appendix N for these additional examples).

Results

Data analysis was performed on the original sample of 32 participants, 16 in each of the two groups, there were no drop outs from treatment.

Measures of Weight

A one-way analysis of variance failed to reveal any pre-treatment differences in weight for the two treatment groups $F(1,30)=2.57$, $p<.05$. The pretest mean for the eating habit group was 190.3 pounds and the posttest mean was 183.13 pounds; the pretest mean for the combined group was 182.75 pounds and the posttest mean was 170.65 pounds. A split-plot factorial 2.2 (Kirk, 1968) ANOVA was performed on the weight loss measure. The between-subjects variable was treatment group (eating habit change vs. eating habit change and exercise). The within-subjects variable was time of testing (pre- and post-treatment). There was a significant main effect for the time of testing (B), $F(1,30)=32.34$, $p<.01$, and a significant A x B interaction ($F(1,30)=28.76$, $p<.05$) effect due to a greater weight loss in the eating habit and exercise group than in the eating habit only group. During the

nine weeks of treatment the mean weight loss for the eating habit group was 7.17 pounds, while the eating habits and exercise group had a mean weight loss of 12.1 pounds.

Measures of Physical Fitness

The physical fitness measures in this study consisted of step test time (the total amount of time a person is able to step up and down on a 16 inch high bench), sit-ups (the total amount of sit-ups a person can complete in one minute), recovery pulse rate (the participant's heart rate one minute after completion of the step test), and the participant's resting pulse rate. These measures of physical fitness were combined in the following manner to form an overall index of one's fitness. The step test and the sit-up score was first transformed into reciprocals by dividing the raw score into 1, so that improvement was reflected in a change from larger scores to lower or smaller scores as it was with resting pulse rate and recovery pulse rate. All four measures of fitness were then converted to standard z-scores. All the pretest z-scores for each participant for each of the four measures of

fitness were then totaled to yield an overall combined pretest fitness score for each participant. Posttest scores were totaled and combined in the same manner to yield an overall combined posttest fitness score for each participant.

A one-way analysis of variance failed to reveal any pretreatment differences in physical fitness for the two treatment groups. A split-plot 2.2 (Kirk, 1968) ANOVA was performed on physical fitness. The between-subjects variable was treatment group (eating habit change vs. eating habit change and exercise). The within subjects variable was time of testing (pre- and post-treatment). There was a significant main effect for time of testing (B), $\underline{F}(1,30)=88.13$, $\underline{p}<.01$. The overall pretest mean for physical fitness was -1.6 (z-score) and the overall posttest mean was 1.79 (z-score).

There was a significant A x B interaction effect, with the combined treatment group (eating habit change and exercise) improving significantly more than the habit change only group in overall physical fitness ($\underline{F}(1,30)=87.70$, $\underline{p}<.01$). The pretest

mean for the eating habit group was .176 (z-score) and the posttest mean was .185 (z-score); while the pretest mean for the combined group was -3.4 (z-score) and the posttest mean was 3.4 (z-score).

During the nine weeks of treatment, the mean change in step test time for the eating habit group was -7.5 seconds (longer step test time indicates improved performance and greater endurance, see Table 1). Thus, this treatment group did not improve and, in fact, did worse on the step test measure at posttest as compared with the pretest measure. In contrast, the eating habits and exercise group had a mean change and improvement in step test time of 63.75 seconds from pre to post treatment measures. The mean improvement on the recovery rate measure (beats/minute) for the eating habit group was -1.25 beats/minute from pre to posttest, while the eating habit and exercise group had a mean improvement in recovery rate of -27.2 beats/minute (decreased recovery rate scores from pre to post measures indicate that the step test caused less stress to the heart; see Table 1). The mean improvement on the resting pulse rate measure

(beats/minute) for the eating habit group was -3.12 beats/minute from pre to posttest, while the combined group had a mean improvement in resting pulse rate of -16.56 beats/minute (decreased resting pulse rate scores from pre to posttest indicate less stress on the heart and improved fitness; see Table 1). The mean improvement in the amount of sit-ups completed in one minute for the eating habit group was .32 sit-ups, while the combined group had a mean improvement in number of sit-ups completed in one minute of 6.25 (see Table 1).

Of the 32 participants participating in the study, only 12 were available to be contacted at the one month telephone follow-up (six from the eating habit group and six from the combined group). Telephone interviews indicated that all six eating habit group participants had maintained their post-treatment weight losses and resting pulse rates. Of the six participants in the combined eating habit and exercise group contacted, four had each lost an additional three pounds and had maintained their post-treatment level resting pulse rates; the two other individuals in this group had no further weight

changes or resting pulse rate changes from post-treatment measures.

Table 1

Mean Physical Fitness and Mean Weight Measures

MEASURE	PRE	POST	CHANGE
Step-test time (in seconds)			
Eating habit group	90.00	82.50	-7.50
Combination group	108.80	172.50	63.80
Recovery Pulse Rate (in beats/minute)			
Eating habit group	128.50	127.30	-1.25
Combination group	113.80	86.60	-27.20
Sit-up Test (in one minute)			
Eating habit group	3.81	4.13	.32
Combination group	6.75	13.00	6.25
Resting Pulse Rate (in beats/minute)			
Eating habit group	90.75	87.63	-3.12
Combination group	83.75	67.19	-16.70
Weight (in pounds)			
Eating habit group	190.30	183.13	-7.12
Combination group	182.75	170.65	-12.10

Discussion

Weight loss was achieved by both the eating habit group and the combined eating habit and exercise group, however, the latter group achieved significantly higher weight loss. This was revealed by the combined group losing 59.3% more weight on the average as compared with the eating habit group. Additionally, the mean weight loss obtained in the combined group (12.1 pounds) is comparable with the results (an average of 11 pounds) obtained in most behavioral programs (Wing & Jeffery, 1979).

The results reveal interesting information about the effects of weight loss on the physical capacity of the individual. In this study, all measures of physical fitness improved most for the group given the combined eating habit and exercise treatment package. The physical fitness measures in this study consisted of step test time (the total amount of time a person is able to step up and down on a 16-inch high bench), sit-ups (the total number of sit-ups a person can complete in one minute), recovery pulse rate (the participant's heart rate one minute after completion of the step test) and the

participant's resting pulse rate.

Some fitness measure improvements were seen for the eating habit group (e.g., recovery pulse rate and resting pulse rate), but these improvements did not extend to endurance or strength tests. Thus, weight loss alone (as found in the eating habit group) did improve some small aspects of physical health, but this improvement was neither as substantial nor as significant as that found in the combined group receiving the exercise component as well as the eating habit change. Therefore, weight loss and health can be affected by decreased energy intake, but not as effectively as a program combining the increaed output with the decreased input.

Participants' verbal reports of eating habits and activity levels were obtained during both pre and posttest sessions through brief (5-10 minute) interviews conducted by the experimenter. Participants were asked questions relating to their present eating habits, their sense of control over their eating, and the amount of activity they recieved (see Appendix C). Participants' verbal reports indicated improvement regardless of the

treatment group (eating habit only vs. the combined group) or amount of weight loss. Participants reported increases in both physical and psychological well-being as well as increased control over their eating habits. For example, participants reported that the establishment of control over their eating habits increased their self-confidence, gave them a sense of control over their life, and helped them to recognize the role that they must play in taking responsibility for their own health.

Participants' self-reports of increase in level of activity indicated more improvement for the combined group as compared with the eating habit only group. Participants in the combined group reported increases in amount of daily walking, increased involvement in recreational sports (i.e., tennis and swimming) and, overall, reported feeling more physically fit. For example, many individuals started participating in recreational activities, such as golf, that they had previously elected to give up due to their weight problem. As one participant explained, "I feel that I have much more

spring to my step now. I'm finding myself getting involved and really enjoying recreational activities I previously had nothing to do with."

One important aspect of this study was the systematic measurement of the relative effects of weight loss strategies on one's physical condition. It suggests the need for more attention to physical fitness if the primary goal of weight control is indeed increased health as opposed to cosmetic concern. It is ironic that the most commonly cited reason for individuals having or needing to lose weight is to reduce health risk factors (i.e., to reduce cardiovascular disease, hypertension, etc.), yet many studies have left the activity side or the energy expenditure side of the weight equation virtually unexplored until recently; and those including an exercise component in their weight loss program have not thoroughly assessed the effects the exercise component had on the participants' health or physical fitness. Therefore, it is suggested that future studies demonstrating weight loss sufficient to improve the health of those participating utilize more adequate measures of

physical fitness. Such measures would include assessments of participant's percentage of body fat, systolic and diastolic blood pressure, and utilization of various fitness tests (i.e., pull-ups for strength, additional walking and running tests for endurance, and various aerobic type exercises to aid in measuring cardiovascular condition and strength) to determine the improvement in one's strength, endurance, and overall fitness.

Informal Procedural Aspects of the Present Study

Experimenter Characteristics. The first aspect involves the experimenter's characteristics. In the present study, the experimenter's "style" in conducting training sessions may have helped to facilitate the treatment effects. For example, the experimenter continuously encouraged questions from the participants and offered himself as a support system to talk with and discuss problems and successes related to the program before, during, and after each session. Approximately half of the participants took advantage of this opportunity, and many expressed satisfaction with the experimenter's helpfulness. Participants who did not utilize the

experimenter as a support system did indicate, however, that they were pleased that the option was available. It appears that the existence of such an option (whether utilized or not) may help to create a more supportive relationship between experimenter and participant.

Another characteristic of the experimenter which may have helped facilitate the treatment effects was the provision and request for several examples to illustrate major principles of behavioral weight control. The experimenter always provided at least two examples in support of each principle discussed, and continuously requested that the participants contribute their own relevant examples and experiences. For example, in the discussion of the principle of stimulus control, the experimenter presented and explained the concept and then provided some examples of how the principle operates on people's behavior (i.e., examples of cues that elicit smoking, drinking, and of course, eating). Participants were then asked to describe their personal experiences as they related to the principle being discussed. It is believed that the

experimenter providing examples in this manner and encouraging participation from the participants helped to create a better understanding of the concepts. Many participants verbally reported that they were pleased with the clarity of instructions. Additionally, it appears that the use of this procedure may have aided in facilitating generalization of the responses to different situations as described in experimenter and participant examples. For example, a few participants reported increased awareness and control over other behaviors (e.g., smoking) through the use of the principles (e.g., stimulus control and cue elimination) which were learned to control eating habits. Also, requesting that participants provide their examples appeared to have facilitated very productive group discussions related to the topic of weight control. The experimenter's role as discussion leader provided many participants with the opportunity to share experiences and make suggestions. It might be advantegeous for future researchers in this area to structure time for discussion of this sort during their training

sessions.

Another characteristic of the experimenter which relates to group discussions has to do with the adoption of the "one down" role. The experimenter would occasionally, during discussions in sessions, assume a "one down" role which permitted different participants to assume a "mastery" (teacher) type of role and educate the experimenter and the other participants based on their expertise and experiences. For example, particular participants who had extensive experience with different diets provided detailed explanations of those various diets, noting their advantages and disadvantages to the group. This arrangement was quite informative and typically lended additional support to the experimenter's program and rationales. The experimenter's occasional adoption of the "one down" role was well accepted by the participants. Feedback received from the participants indicated that they were happy to be able to contribute and pleased that the experimenter took the time to listen and learn.

A final experimenter characteristic which was

noted and may have helped to facilitate the treatment effects involved the use of humor. At the start of each training session, the experimetner would briefly present entertaining and humorous information obtained from local newspapers, popular magazines, and radio and television about people and efforts at losing weight. This use of humor, programmed into the beginning part of each session, appeared to have produced a more relaxed and friendly environment for the group. Participants were frequently observed laughing and contributing their own humorous experiences. This strategy seemed to further promote cohesiveness and support in both of the groups.

Therefore, it appears that experimenter characteristics such as offering oneself as a support system, prompting discussions and providing examples, adoption of a "one down" role, and the use of humor may have helped to faciliate the treatment effects obtained. These characteristics appeared to positively reinforce and maintain such participant responses as seeking help for problems encountered in the program, discussion

and contribution of personal experiences, the offering of support to others, and the maintenance of motivational levels necessary for successful participation in the program (i.e., motivation to attend and participate). Many participants reported that they looked forward to attending the weekly meetings and found the experiences very reinforcing.

Based on this information, perhaps future studies should examine empirically, the qualitative characteristics of experimenter behavior in order to test the relevance of such factors to weight loss effects obtained. In addition to the characteristics noted in this study, researchers may also want to test the relevance of such characteristics as the promptness, clarity and efficiency of the experimenter. Such a test might compare experimenters who possess such characteristics (i.e., humor or promptness) versus those who do not. Additionally, it might be interesting to compare male and female experimenters who do and do not possess such characteristics. These tests may reveal very important factors necessary for the success of weight control programs.

Participant Characteristics. The second informal procedural aspect which may have helped to facilitate treatment efficacy relates to participant characteristics. In particular, the participants' skill repertoires. The majority of people participating in the study had most of the skills necessary for success in their weight control efforts. For example, when the basic weight control and activity principles and suggestions (i.e., using the stairs as opposed to the elevator) were presented to the participants, the common response was, "Oh yes, why didn't I think of that?" This may suggest that for many of the participants their difficulty in controlling their weight and activity levels was not always due to a skill deficit but possibly instead due to motivational factors. For these participants, suggested arrangement of consequences (both positive and negative) appeared to help control their eating habits and increase their level of activity. Many participants admitted knowing what they needed to do to control their weight, but needed assistance in arranging a more supportive and motivating environment in which

to attempt this control.

This issue brings up an interesting point in regard to future research. The population of participants in the present study consisted primarily of white, middle-class, college educated adults (with a few exceptions), who in many cases, already possessed most of the skills and resources necessary for potential success in their weight control efforts. Most participants were financially stable enough to change from eating high starch-type foods to low-calorie vegetables (which are often more expensive), and had no physical limitations which would prevent them from participating in the activity aspects of the program (i.e., walking, running, etc.). On the other hand, populations such as the low-income and physically disabled, who may lack the necessary financial resources (i.e., money to buy expensive vegetables, etc.) or have physical limitations (i.e., confined to a wheelchair or crutches) which may prevent them from the form of actvitity suggested in this study, might benefit from weight control programs tailored more towards their specific needs. Future studies might be well

advised to concentrate their efforts on designing appropriate weight control technologies for such groups of individuals.

Observer Training. A third informal aspect of the study which may have hindered the measurement of the treatment effects involved observer training. In the present study, different observers were trained just prior to the pretesting phase in different areas of data collection, such as taking pulse rates, counting the number of sit-ups completed in one minute, weighing individuals, measuring percentage body fat, and so on. One problem encountered in this study was the absence, on the evening of pretesting, of the observer trained to measure percentage body fat. Unfortunately the experimenter and other observers were responsible for other various data collection stations and consequently the measure was not obtained. It is felt that this point relates to observer training in that future experimenters in this area may want to train additional observers as "back-ups" to prevent the problems encountered in this study. Additionally, "booster" training

sessions for observers every couple of weeks during a 9 to 10-week weight control program, might prove helpful in ensuring that observers remain competent and reliable in their specific areas of data collection. This experimenter suggests that observer training not be taken lightly (especially when measuring indices of health); and that future researchers strive to develop preventative strategies for such situations.

Conclusions. In conclusion, it is recommended that the future direction of weight loss research attend to both the formal procedural aspects (i.e., fitness improvement and health level measurement) and informal procedural aspects (i.e., experimenter and participant characteristics and observer training), when designing and implementing their treatment programs. The successful prevention and treatment of obesity are dependent upon an understanding of these mechanisms and the incorporation of this knowledge into intervention strategies. Testing the relevance of such factors may open new doors to the treatment of obesity.

References

Abramson, E. E. (1977). Behavioral approaches to weight control: an updated review. Behavior Research and Therapy, 15, 355-363.

Bellack, A. S. (1976). A comparison of self-reinforcement and self-monitoring in weight reduction program. Behavior Therapy, 7, 68-75.

Bellack, A. S., Rozensky, R., & Schwartz, J. (1974). A comparison of two forms of self-monitoring in a behavioral weight reduction program. Behavior Therapy, 5, 523-530.

Benedict, F. G., Miles, W. R., Roth, P., & Smith, M. (1919). Human vitality and efficiency under prolonged restricted diet. Washington, D. C.: Carnegie Institute.

Bernard, J. L. (1968). Rapid treatment of gross obesity by operant techniques. Psychological Report, 23, 663-666.

Bjorntorp, P. (1976). Exercise in the treatment of obesity. Clinics in Endocrinology and Metabolism, 5, 431-453.

Brownell, K. D., & Stunkard, A. J. (1980). Physical activity in the development and

control of obesity. In A. J. Stunkard (Ed.), Obesity. Philadelphia, PA.: Saunders.

Brownell, K. D., Stunkard, A. J., & Albaum, J. M. (1980). Evaluation and modification of exercise patterns in the natural environment. American Journal of Psychiatry, 137, 1540-1545.

Carmody, T. P., Senner, J. W., Malinow, M. R., & Matarazzo, J. D. (1980). Physical exercise rehabilitation: Long-term dropout rate in cardiac patients. Journal of Behavioral Medicine, 3, 163-168.

Cautela, J. R. (1966). Treatment of compulsive behavior by covert sensitization. Psychological Record, 16, 33-41.

Cautela, J. R. (1967). Covert sensitization. Psychological Report, 20, 459-468.

Cautela, J. R. (1972). The treatment of overeating by covert conditioning. Psychotherapy: Theory, Research, and Practice, 9, 211-216.

Christakis, G. (1966). Effect of combined nutrition-education-physical fitness program on weight status of obese high school boys. Federal Proceedings: Federation of American

Societies for Experimental Biology, 25, 15-19.

Christensen, A., & Barrious, E. (1975). Partners, pay-offs, and pounds: A Treatment program for the overweight. Paper presented at the annual meeting of the Western Psychological Association. Sacramento, California.

Cooper, K. H. (1970). The new aerobics. New York: Bantum Books.

Dahlkoetter, J., Callahan, E. J., & Linton, J. (1979). Obesity and the unbalanced energy equation: exercise versus eating habit change. Journal of Consulting and Clinical Psychology, 47, 898-905.

Dinoff, M., Rickard, H. C., & Colwick, J. (1972). Weight reduction through successive contracts. American Journal of Orthopsychiatry, 42, 110-113.

Dishman, R. K., & Gettman, L. R. (1980). Psychobiologic influences on exercise adherence. Journal of Sport Psychology, 2, 295-310.

Dublin, L. I. (1953). Relation of obesity to longevity. New England Journal of Medicine, 248, 971.

Duddleston, A. K., & Bennion, M. (1970). Effect of

diet and/or exercise on obese college women. Weight loss and serum lipids. Journal of American Dietetic Association, 56, 126-129.

Elliot, C. H., & Denny, D. R. (1975). Weight control through covert sensitization and false feedback. Journal of Consulting and Clinical Psychology, 42, 842-850.

Epstein, L. H., & Wing, R. R. (1980). Aerobic exercise and weight. Addictive Behaviors, 5, 371-388.

Epstein, L. H., Thompson, J. K., & Wing, R. R. (1980). The effects of contract and lottery procedures on attendance and fitness in aerobics exercise. Behavior Modification, 4, 465-480.

Farquhar, J. W. (1978). The American way of life need not be hazardous to your health. New York: W. W. Norton and Co.

Fixx, J. F. (1977). The complete book of running. New York: Random House.

Foreyt, J. O., Goodrick, C. K., & Gotto, A. M. (1981). Limitations of behavioral treatment of obesity: Review and analysis. Journal of

Behavioral Medicine, 4, 159-174.

Foreyt, J. P., & Kennedy, W. A. (1971). Treatment of overweight by aversion therapy. Behavior Research and Therapy, 9, 29-34.

Garrow, J. S. (1978). Energy balance and obesity in man (2nd ed.). Amsterdam: Elsevier.

Gwinup, G. (1975). Effect of exercise alone on the weight of obese women. Archives of Internal Medicine, 135, 676-680.

Hagen, R. L. (1974). Group therapy vs. bibliotherapy in weight reduction. Behavior Therapy, 5, 222-234.

Hanson, R. W. (1974). Effects of programmed learning and therapist group contract in treating obesity. Paper presented at the annual meeting of the Western Psychological Association, San Francisco, California.

Harmatz, M. G., & Lapuc, P. (1968). Behavior modification of overeating in a psychiatric population. Journal of Consulting and Clinical Psychology, 32, 583-587.

Harris, M. B., & Hallbauer, E. S. (1973). Self-directed weight control through eating and

exercise. Behavior Research and Therapy, 11, 523-529.

Heinzelmann, F., & Bagley, R. W. (1970). Response to physical activity programs and their effects on health behavior. Public Health Reports, 85, 905-911.

Hockey, R. V. (1977). Physical Fitness: The pathway to healthful living. St. Louis, Missouri: Mosby.

Homme, L. E. (1965). Perspectives in psychology: XXIV. Control of coverants, the operants of the mind. Psychological Record, 15, 501-511.

Horan, J. J., & Johnson, R. G. (1971). Coverant conditioning through a self-management application of the Premack Principle: Its effects on weight reduction. Journal of Behavior Therapy and Experimental Psychiatry, 2, 243-249.

Janda, L. H., & Rimm, D. C. (1972). Covert sensitization in the treatment of obesity. Journal of Abnormal Psychology, 80, 37-42.

Jeffery, D. B., Christensen, E. R., & Pappas, J. P. (1977). A case study report of a weight

reduction group: treatment and follow-up. (Research and development report No. 33). University of Utah (Salt Lake City) Counseling Center.

Jeffery, D. B., & Katz, R. C. (1977). Take it off and keep it off. Englewood Cliffs, New Jersey: Prentice Hall.

Katahn, M. (1982). The 200 calorie solution. New York: W. W. Norton and Company.

Kenrick, M. M., Ball, M. R., & Canaru, J. J. (1972). Exercise and weight reduction in obesity. Archives of Physical and Medical Rehabilitation, 53, 323-327.

Kirk, R. E. (1968). Experimental Design: Procedures for the behavioral sciences. Belmont, California: Wadsworth.

LeBow, M. D. (1977). Can lighter become thinner? Addictive Behaviors, 3, 116-120.

Leon, A. S., Conrad, J., Hunninghake, D. B., & Serfass, R. (1979). Effects of a vigorous walking program on body composition and carbohydrate and lipid metabolism of obese young men. American Journal of Clinical

Nutrition, 33, 1776-1787.

Levitz, L. S., & Stunkard, A. J. (1974). A therapeutic coalition for obesity: Behavior modification and patient self-help. American Journal of Psychiatry, 131, 423-427.

Lick, J., & Bootzin, R. (1971). Covert sensitization for the treatment of obesity. Paper presented at the meeting of the Midwestern Psychological Association, Detroit, Michigan.

Mahoney, M. J. (1974). Self-reward and self-monitoring techniques for weight control. Behavior Therapy, 5, 48-57.

Mahoney, M. J., Moura, N, G., & Wade, T. C. (1973). Relative efficacy of self-award, self-punishment, self-monitoring techniques for weight loss. Journal of Consulting and Clinical Psychology, 40, 404-407.

Mann, R. A. (1972). The behavior-therapeutic use of contingency contracting to control an adult behavior problem: Weight control. Journal of Applied Behavior Analysis, 5, 99-109.

Manno, B., & Marston, A. R. (1972). Weight

reduction as a function of negative covert reinforcement (sensitization) versus positive covert reinforcement. Behavior Research and Therapy, 10, 201-207.

Massie, J. F., & Shephard, R. J. (1971). Physiological and psychological effects of training - A comparison of individual and gymnasium programs with a characterization of the exercise "drop-out." Medicine and Science in Sports, 3, 110-117.

Mayer, J., Roy, P., & Mitra, K. P. (1956). Relation between caloric intake, body weight, and physical work. American Journal of Clinical Nutrition, 4, 169-175.

McReynolds, W. T., Lutz, R. N., Paulsen, B. K., & Kohrs, M. B. (1976). Weight loss resulting from two behavior modification procedures with nutritionists as therapists. Behavior Therapy, 7, 283-291.

Meyer, V., & Crisp, A. H. (1964). Aversion therapy in two cases of obesity. Behavior Research and Therapy, 2, 143-147..

Moody, D. L., Kollias, J. G., & Buskirk, E. R.

(1969). The effect of a moderate exercise program on body weight and skinfold thickness in overweight college women. Medicine and Science in Sports, 1, 75-80.

Romanczyk, R. G. (1974). Self-monitoring in the treatment of obesity: Parameters of reactivity. Behavior Therapy, 5, 531-540.

Romanczyk, R. G., Tracey, D. A., Wilson, G. T., & Thorpe, G. L. (1973). Behavioral techniques in the treatment of obesity: A comparative analysis. Behavior Research and Therapy, 11, 629-640.

Sach, L. B., & Ingram, G. L. (1972). Covert sensitization as a treatment for weight control. Psychological Report, 30, 971-974.

Sanne, H. (1973). Exercise tolerance and physical training of non-selected patients after myocardial infarction. Acta Medica Scandinavica, Suppl. 551, 5-124.

Schachter, S. (1971). Some extraordinary facts about obese humans and rats. American Psychologist, 26, 129-144.

Shick Aversion Therapy: Condition yourself to

thinness. (1976, July). Coronet, pp. 23-29.

Solomon, N. (1980). High health diet and exercise plan. New York: Berkeley Books.

Stalonas, P. M., Jr., Johnson, W. G., & Christ, M. (1978). Behavior modification for obesity: The evaluation of exercise, contingency management, and program adherence. Journal of Consulting and Clinical Psychology, 46, 463-469.

Stamler, J. (1980). Prevention and control of hypertension by nutritional-hygenic means. Journal of the American Medical Association, 243, 1819-1823.

Stuart, R. B. (1967). Behavioral control of overeating. Behavior Research and Therapy, 5, 337-365.

Stuart, R. B. (1978). Act thin, stay thin. New York: W. W. Norton.

Stuart, R. B., & Davis, B. (1974). Behavioral control of obesity. Paper presented at the Fourth annual Southern California Conference on Behavior Modification, Los Angeles, California.